

Group: **Fan Coil**

Part Number: IM 846

Date: July 2006

## **T170 Thermostat**

**24 VAC/120–277 VAC****3-Speed Fan Control (Continuous or Cycling) or Staged Fan Control**

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# Installation Instructions

## ⚠ WARNING

- BEFORE ATTEMPTING TO INSTALL, OPERATE, OR SERVICE THIS THERMOSTAT, CAREFULLY READ THESE INSTRUCTIONS.
- Failure to observe safety information and comply with instructions could result in PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE.
- To avoid potential fire and/or explosion, do not use in potentially flammable or explosive atmospheres.
- Retain these instructions for future reference. This product, when installed, is part of an engineered system whose specifications and performance characteristics are not designed or controlled by McQuay. You must review your application and national and local codes to assure that your installation is functional and safe.

## ⚠ DANGER

Hazardous voltage. To avoid electrical shock or damage to equipment, disconnect power before installing or servicing. Failure to follow these instructions will result in death or serious injury.

## Thermostat Model and Part Number

McQuay offers two different thermostats depending on the fan speed control used (Table 2).

**Table 1: Thermostat model and part numbers**

Thermostat Model #	McQuay Part #	Fan Speed Control
TA170-001	107345335	3-Speed Fan Control
TB170-001	107345336	Staged Fan

**Note** – For a list of thermostat features, refer to ED 3611.

## Optional Occupancy Detection Sensors/Kits

In addition to the T170 thermostat, McQuay offers optional occupancy detection sensors (see page 9) that can be ordered and used in conjunction with the thermostat. When ordering, use the associated kit number(s) provided in Table 2.

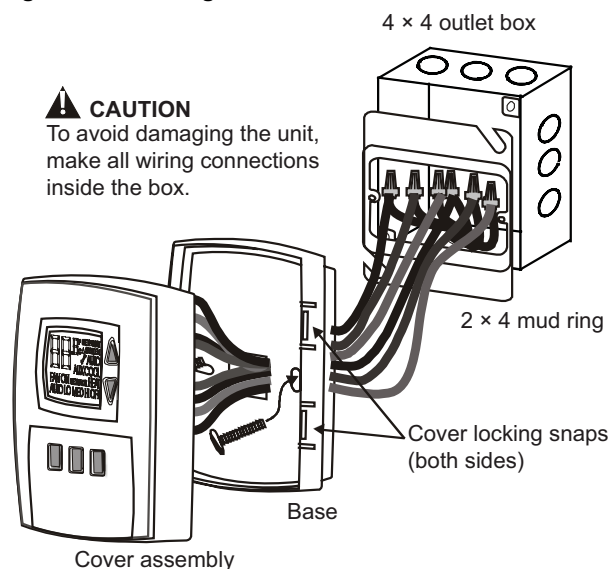
**Table 2: Occupancy sensor model and kit numbers**

Sensor Model #	McQuay Kit #
SA200-001	6677877211
SB200-001	6677877311
SD200-001	6677877411
SB200-002	6677877511

## Mounting and Wiring the Thermostat

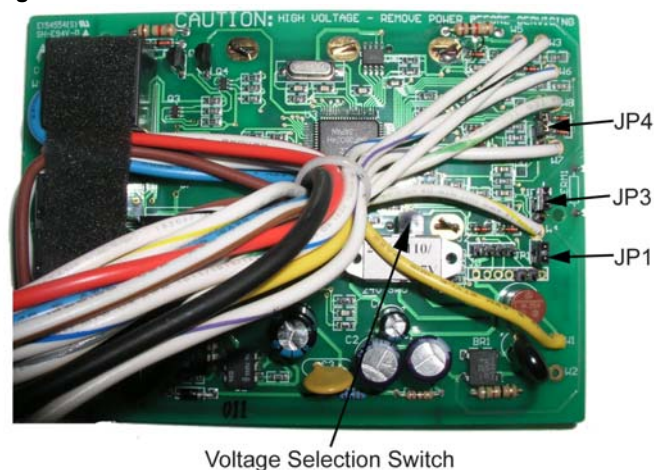
The thermostat base mounts to a field provided 4" × 4" outlet box with a 2" × 4" mud ring (Figure 1). The thermostat cover assembly mounts to the thermostat base.

**Figure 1: Mounting the thermostat**



- 1 Disconnect power before installing or servicing.
- 2 Run line voltage wiring (and low voltage wiring if applicable) into the field provided outlet box and mud ring (Figure 1).
- 3 Locate all connections within the mud ring/connection box and wire nut all unused wires.
- 4 Remove the thermostat cover assembly from its base to gain access to the circuit board (Figure 2).

**Figure 2: Circuit board**



## Installation Instructions

- 5 On the circuit board, set the voltage selection switch (Figure 2) to the appropriate voltage for the application
- 24 V = 24 VAC
  - 110–277 V = 120, 240, or 277 VAC.

**Note:** The circuit board is shipped with the voltage selection switch in the 110-227 V position. For 24 VAC use, the switch must be in the 24 V position.

### CAUTION

Before applying power, the voltage selection switch must be in the appropriate position. Failure to select the correct voltage can cause thermostat malfunction or permanently damage the thermostat.

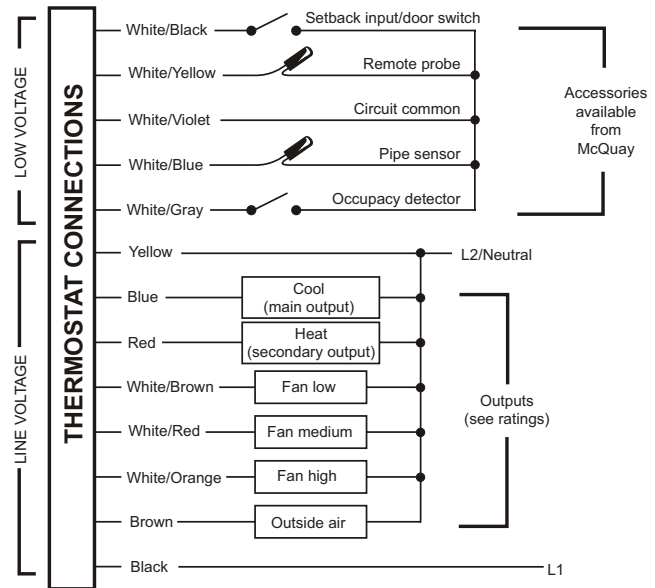
- 6 The circuit board is also equipped with configuration jumpers (JP1, JP3, and JP4 in Figure 2). Depending on the application, it may be necessary to reconfigure the following jumpers:
- **JP4:** 2/4 Pipe Sensor Jumper - This jumper selects between 2-pipe (jumper ON) and 4-pipe (jumper OFF) operation (see “Fan Operation” on page 7).
  - **JP3:** Door/Window Switch Jumper - This jumper is shipped normally open. Placement of a jumper allows for occupancy detection and door/window switch only operation (see “Optional Occupancy Detection Equipment Operation” on page 9).
  - **JP1:** Removal of this jumper allows the sensor to be located in a remote location.

### CAUTION

To use a remote sensor on units with local sensing capability, remove jumper JP1 to disable local sensing. Failure to remove JP1 can cause improper operation of the thermostat with a remote probe installed.

- 7 Connect the color coded thermostat wires (Figure 3) to the line voltage wires located in the mud ring/connection box and secure the connections with wire nuts.

**Figure 3: Wiring diagram**



### CAUTION

Use copper wire only. Insulate or wire nut all unused leads. Avoid electrostatic discharge to the thermostat. Failure to do so can cause thermostat malfunction or permanently damage the thermostat.

- 8 Install the thermostat base to the mud ring/outlet box using two furnished mounting screws. Tighten the screws evenly but do not over tighten.

**Note:** An output ratings chart (Table 3) is located on the inside of the base.

**Table 3: Output ratings**

Voltage	Inductive		Resistive amps	Pilot duty	HP
	FLA	LRA			
24 VAC	NA	NA	NA	24 VA	NA
120 VAC	5.8	34.8	6.0	125 VA	1/4
240 VAC	2.9	17.4	5.0	125 VA	1/4
277 VAC	2.4	14.4	4.2	125 VA	1/4



### DANGER

Hazardous voltage. Combined load current is not to exceed 20 amps. Mount only to a grounded metallic box. Low voltage wiring is Class 2. To avoid electrical shock or damage to equipment, disconnect power before installing or servicing. Failure to follow these instructions will result in death or serious injury.

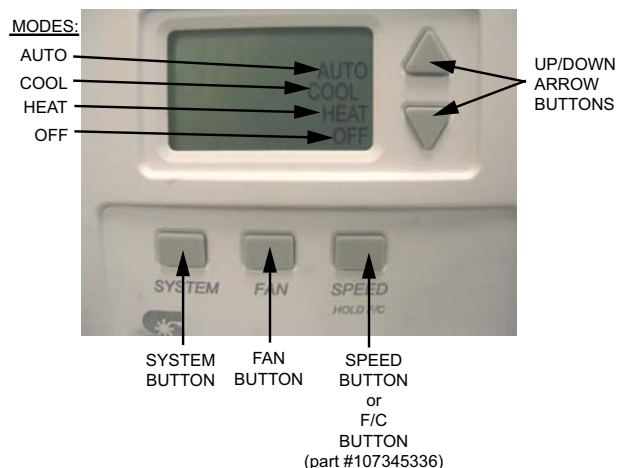
- 9 With the base now secured, verify that the circuit board is firmly snapped into the cover and is not dislodged.
- 10 Install the cover assembly to the base, pressing firmly to engage the cover locking snaps.

# Operation

## Thermostat Button Operation

The thermostat interface (Figure 4) contains buttons for use in navigating to accompanying menus/screens and for performing specific operations. These buttons and operations are described below.

**Figure 4: Thermostat interface (model #TA170-001 shown)**



### System Button Operation

The System button (Figure 4) contains and displays the following modes of operation:

**OFF**—All thermostat outputs are off. The fan is still operational if FAN ON is selected.

**AUTO**—The thermostat automatically selects heating or cooling mode depending on the set point and room temperature. If demand exists, the appropriate HEAT or COOL icon illuminates. A 3°F dead band is provided to prevent short cycling between heating and cooling modes. After changeover, the control point automatically shifts so that the control OFF point equals the set point temperature.

**COOL**—The thermostat operates as a cooling only thermostat.

**HEAT**—The thermostat operates as a heating only thermostat.

### UP/Down Arrow Button Operation

Use the Up and Down arrow buttons (Figure 4) to increase or decrease the temperature.

### Fan Button Operation

Use the Fan button (Figure 4) to control operation of the fan. In the ON position, the fan output operates continuously. In the AUTO position, the output cycles with demand. In the OFF position, all outputs are off.

**Note** – Model #TB170-001 (part #107345336) has staged fan control.

### Speed Button Operation (TA170-001)

The fan Speed button (Figure 4) for model #TA170-001 (part #107345335) is determined by manually selecting HI, MED, or LO. Press and hold the Speed button for five seconds to toggle the displayed temperature from Fahrenheit to Celsius.

### F/C Button Operation (TB170-001)

Model #TB170-001 (part #107345336) is configured for staged fan control and therefore utilizes a F/C button (Figure 4) instead of a Speed button. When pressed, the F/C button toggles between Fahrenheit and Celsius.

## Verifying Thermostat Operation

To verify thermostat operation after mounting and wiring it, perform the following:

- 1 Energize the system.
- 2 Set the fan to ON.
- 3 Select each fan speed, if available, to verify operation.
- 4 Set the system button to AUTO or other available selection.
- 5 Using the UP arrow, adjust the temperature to more than 5°F above ambient temperature to cycle on heating.
- 6 Using the DOWN arrow, adjust the temperature to more than 5°F below ambient temperature to cycle on cooling.

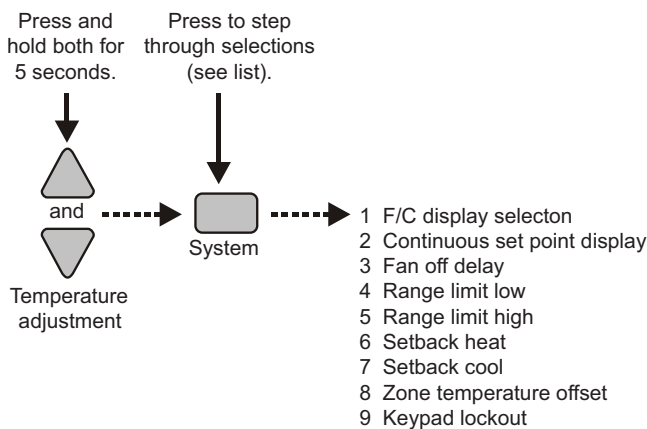
## Thermostat Menu Functions

The thermostat menu contains nine functions which can be accessed using controls on the thermostat. Accessing the menu functions and details of each function are described below.

### Menu Function Access

- 1 Press and hold the UP and DOWN arrow buttons (Figure 5) for five seconds.
- 2 The current display clears and the number “1” appears.
- 3 Press the SYSTEM button to scroll to the next item number.
- 4 Use the UP and DOWN buttons to make changes within the selected number.

**Figure 5: Thermostat menu**



### Menu Functions

#### 1 F/C (Fahrenheit/Celsius) display selection

When this function is selected, the F and C icons appear and the selected icon flashes. To toggle between F or C, press the up or down arrow button.

#### 2 Continuous set point display

When this function is selected, the F or C icon, current digits, and the set point icon appear. If the Continuous set point display is enabled, the set point icon flashes. To toggle between continuous display of set point and display of zone temperature, press the up or down arrow button.

#### 3 FAN off delay

When this function is selected, the FAN, OFF, and digits appear. The digits represent the number of seconds the fan stays on after the heating and cooling outputs are turned off. To increase or decrease the value from 0–255 seconds, press the up or down arrow button.

#### 4 Range limit low

When this function is selected, the current minimum range setting, the SET POINT icon, and the LO icon appear. To increase or decrease the value, press the up or down arrow button.

#### 5 Range limit high

When this function is selected, the current maximum temperature range adjustment, SET POINT icon, and LO icon appear. To increase or decrease the value, press the up or down arrow button.

#### 6 Set back heat

When this function is selected, the current temperature range adjustment, the SET BACK icon, and the HEAT icon appear. To increase or decrease the value, press the up or down arrow button.

#### 7 Set back cool

When this function is selected, the current Cool setback value, the SET BACK icon, and the COOL icon appear. To increase or decrease the value, press the up or down arrow button.

#### 8 Zone temperature offset

When this function is selected, the numeric ones and tenths (0.0) appear with a leading minus sign. To increase or decrease the value  $\pm 9^{\circ}\text{F}$ , press the up or down arrow button. Increments are made in  $1^{\circ}\text{F}$  and  $0.5^{\circ}\text{C}$ .

#### 9 Keypad lockout

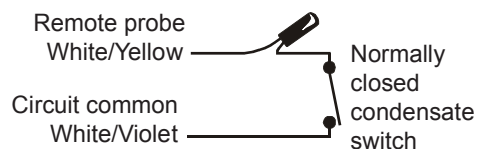
When this function is selected, the ON and OFF icons appear. The enabled icon flashes. OFF is the default. ON disables the keypad except for entry into the service menu. To increase or decrease the value, press the up or down arrow button.

**Note** – In the event of a power failure, these values are stored and can be recalled.

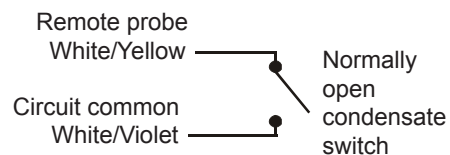
### Condensate Overflow Interrupt

The remote probe input can be used with a condensate overflow switch (CO), either in conjunction with a remote probe (normally closed CO switch, Figure 6), or with local sensing (normally open CO switch, Figure 7). When the condensate switch activates, the thermostat displays a service wrench icon and disables all outputs.

**Figure 6: Remote probe installation**



**Figure 7: Local sensor installation**



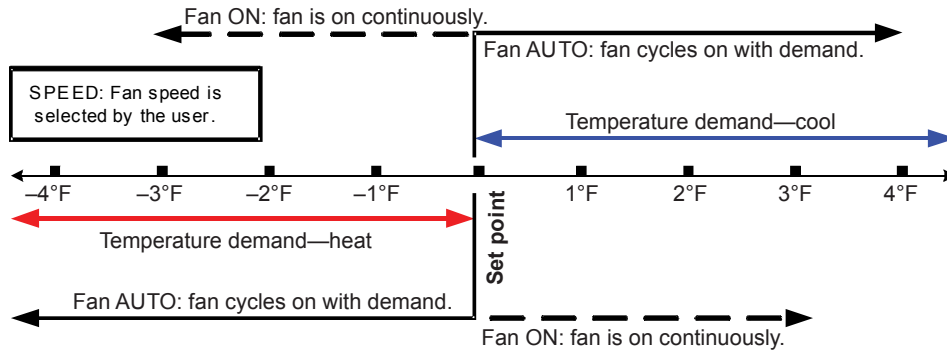
## Fan Operation

The thermostat may be factory configured for standard or staged fan operation.

### Standard Fan Configuration (TA170-001)

Units with standard fan operation (Figure 8) have a selectable fan Speed button.

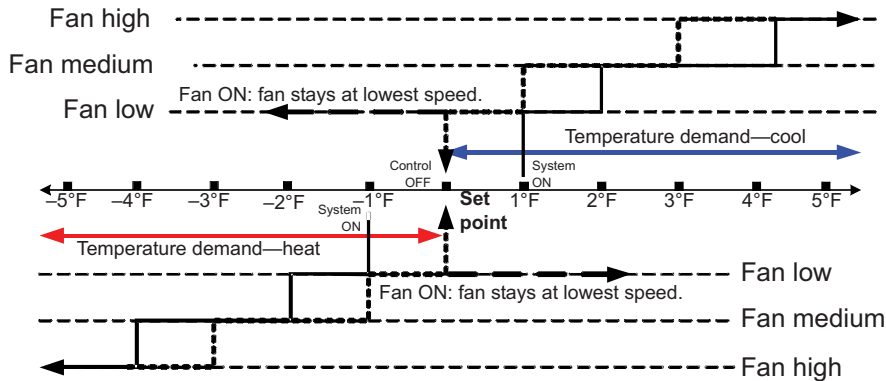
**Figure 8: Standard fan operation**



### Staged Fan Configuration (TB170-001)

Factory configuration is available for staged fan operation (Figure 9) to provide occupant comfort while using the most effective fan speed.

**Figure 9: Staged fan operation**



### Controlled Off Factory Configuration

A factory configuration may be provided for minimum heating and cooling requirements. Using this configuration, the HEAT and COOL outputs are automatically cycled on at the heat setback limit. Your thermostat may not have this feature.

## Fancoil Operation

Fancoil operation is either a 2-pipe or 4-pipe configuration which is determined by jumper selection JP4 (see “Mounting and Wiring the Thermostat” on page 3).

### 2-Pipe Operation

In this configuration, the thermostat permanently disables the secondary output and disables the fan from cycling in an invalid mode. The main output configuration is dependent on the pipe sensor input. With a pipe sensor connected, the thermostat automatically selects heating or cooling depending on the sensed water temperature. If the pipe sensor input is open (unconnected), the main output only cools. If the pipe sensor input is shorted, the main output only heats. Normal thermostat default is for 4-pipe operation. For 2-pipe operation, install a jumper on JP4.

### 4-Pipe Operation

In this configuration, both the main output (COOL) and the secondary output (HEAT) are available. These both cycle ON depending on the mode of the thermostat. With a pipe sensor connected, the thermostat automatically changes the main output to heat and disables the secondary output if the main coil water is hot. For 4-pipe operation, the JP4 jumper is removed.

### Pipe Sensor Operation

A pipe sensor can be connected when the thermostat is configured for either 2-pipe or 4-pipe configuration. The pipe sensor is used to determine the water temperature in the main coil, which should be connected to the primary output.

Pipe sensor input—use a 10K Remote Probe or a standard ON-Off Aquastat for summer/winter changeover.

### Purge Cycle

With a pipe sensor connected, the thermostat initiates a purge cycle if the sensed water temperature is ambiguous (not adequately hot or cold). The sequence for purge cycle operation is as follows:

- 1 The thermostat has a call for heat or cooling.

**Note:** If at any time the call goes away, the thermostat stops the purge cycle.

- 2 The thermostat checks the pipe sensor to verify water temperature.

- 3 If the water temperature is beyond 15°F of the set point, normal HVAC control occurs.
- 4 If the water temperature is not beyond 15°F of the set point, the thermostat checks to see if the water temperature is above 80°F or below 60°F.

If yes, normal HVAC control occurs.

If no, the thermostat opens the main output (COOL) for three minutes.

- 5 After the three minute purge cycle occurs, the thermostat checks to see if the water temperature is more than 15°F from the set point, or above 80°F, or below 60°F.

If yes, normal HVAC operation occurs.

If no, the valve is left open and the thermostat continues to search for a valid reading.

**Note –** If at any time the demand goes away, the thermostat will stop the purge cycle.

Table 4 shows output operation, depending on the sensed water temperature.

**Table 4: Output operation**

2-Pipe/4-Pipe selection	Water temperature	Output operation	
		Main output	Secondary output
2-pipe JP4 ON	Cold	Cooling only The fan does not cycle on with a heat demand.	Disabled
	Hot	Heating only The fan does not cycle on with a cool demand.	Disabled
4-pipe JP4 OFF	Cold	Cooling	Heating
	Hot	Heating only The fan does not cycle on with a cool demand.	Disabled

## Setback Operation

In this configuration, the low level switch input normally is open. To enable setback operation, the JP3 jumper is removed (see “Mounting and Wiring the Thermostat” on page 3). The input will close and the thermostat heating and cooling setback limits can then be used as temperature control points. Fan operation in setback is cycled with demand. Press any thermostat key to override setback for one hour. Setback overrides any user setting except if the control is turned to OFF.



## Optional Occupancy Detection Equipment Operation

The T170 thermostat can be used with optional S200 series occupancy detection equipment. Purchasing and installing this equipment to compliment the thermostat adds energy savings by setting back HVAC operation during occupied and unoccupied times. Optional detection equipment configurations and operation are described below.

### SB200-001 Occupancy Sensor

The SB200-001 occupancy sensor (Figure 10) serves as an occupancy sensor for automatic control of a guest room HVAC system. It incorporates an innovative dual delay processor which allows the sensor to verify the nature of occupancies, and is capable of eliminating unnecessary actuations of the HVAC device due to unintentional passages or short time occupancies. The sensor may also serve as a slave sensor (Figure 11 on page 10).

The sensor switch is open in occupied mode and closed in unoccupied mode. An optional door and/or window switch (Figure 10) is open when the door/window is open and is closed when the door/window is closed.

**Note –** To use this configuration, a jumper must be installed to JP3 to allow occupancy input.

**Note –** An optional door and/or window switch (Figure 10) can be added for use with the SB200-001 sensor.

### Operation

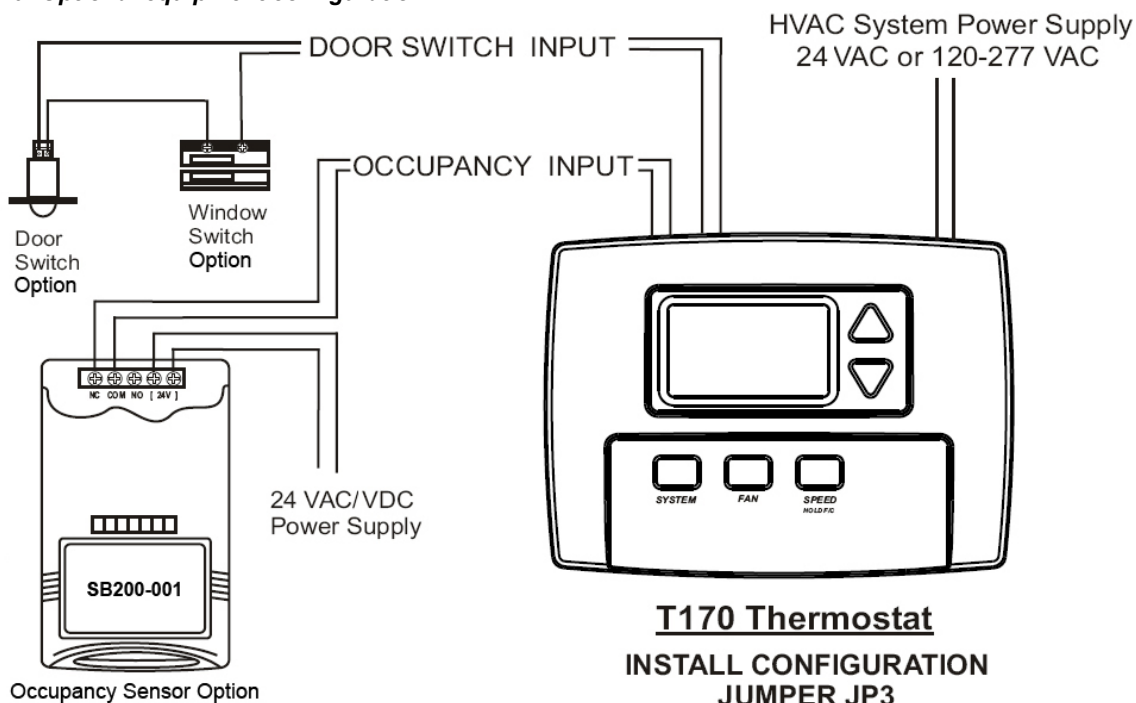
In an occupied mode, the thermostat operates normally and looks for a door open signal. When the door opens, the thermostat waits for a door close signal. If the door is open for more than two minutes, the thermostat turns the HVAC system outputs to OFF. During this two minute period, if any button is pressed on the keypad, the time delay is extended to ten minutes. The time delay can only be extended once. Once the HVAC outputs transition to OFF, a door closure is required to re-enable the outputs. When the door closes, the thermostat starts a two minute timer and tries to detect occupancy. If the timer expires and no occupancy is detected, the thermostat transitions to an unoccupied state. If occupancy is detected while the timer is running, the thermostat will remain in the occupied mode.

In an unoccupied mode, the thermostat sets heating and cooling set points to setback values as determined by factory or user settings. The fan is automatically set to cycle with demand. The thermostat continually monitors the occupancy sensor and will enter into occupied mode if occupancy is detected.

If the installation is only using a door/window switch, the thermostat will disable the HVAC outputs if this output is open for longer than two minutes.

To enable door/window switch only operation, install a jumper to JP3 (see “Mounting and Wiring the Thermostat” on page 3) and the occupancy input must be shorted to circuit common.

**Figure 10: Optional equipment configuration #1**



### SD200-001 Occupancy Sensor

The SD200-001 occupancy sensor (Figure 11) serves as a master sensor for a guest room HVAC management system. The sensor provides HVAC operation according to occupancy status, as well as door/window switch monitoring, selectable high/low temperature setback, form-C output, slave sensor connectivity, and a five minute door open HVAC shut-off.

**Note** – To use this configuration, the jumper to JP3 is removed to allow setback input.

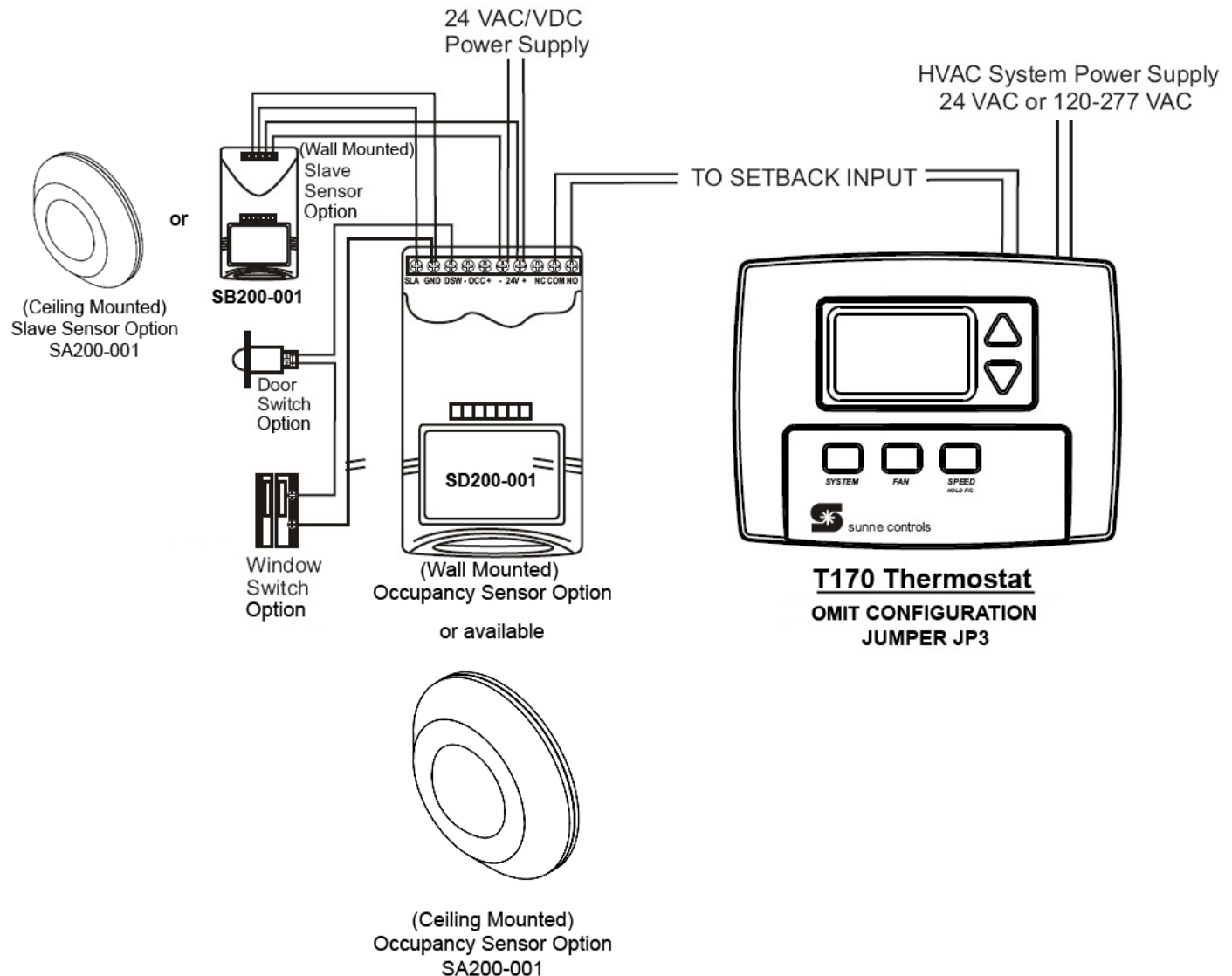
**Note** – An optional door and/or window switch (Figure 11) and slave sensor can be added for use with the SD200-001 sensor.

### Operation

In an occupied mode, the SD200-001 occupancy sensor (Figure 11) and door switch use advanced microprocessor logic to determine occupancy. A door open signal will initiate occupancy status detection. If the sensor determines that a room is occupied, it will allow normal HVAC control. The sensor will wait for another door open signal before determining occupancy again.

In an unoccupied mode, the sensor continually monitors the room. Any occupancy detection will set the operation to occupied mode.

**Figure 11: Optional equipment configuration #2**



## SD200-002 Occupancy Sensor

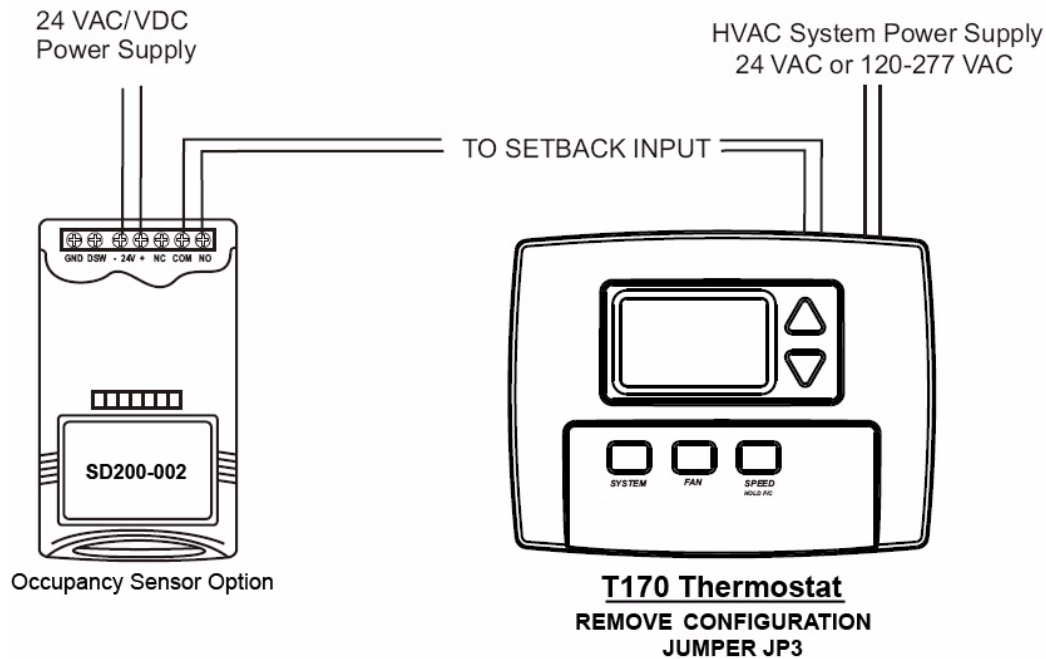
The SD200-002 occupancy sensor serves as a stand alone master sensor for a guest room HVAC management system. The sensor provides HVAC operation according to occupancy status, as well as selectable high/low temperature setback, form-C output, and a five minute door open HVAC shut-off. This system provides basic room setback and is ideal for control of HVAC in commercial spaces.

**Note** – To use this configuration, the jumper to JP3 is removed to allow setback input.

## Operation

With each occupancy detection, an OFF delay is started and can be set to delay for up to 30 minutes.

**Figure 12: Optional equipment configuration #3**



### **McQuay Training and Development**

Now that you have made an investment in modern, efficient McQuay equipment, its care should be a high priority. For training information on all McQuay HVAC products, please visit us at [www.mcquay.com](http://www.mcquay.com) and click on training, or call 540-248-9646 and ask for the Training Department.

### **Warranty**

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This document contains the most current product information as of this printing. For the most up-to-date product information, please go to [www.mcquay.com](http://www.mcquay.com).

